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**ASEAN+3 and RTAs and their Impact on Asia-Australia Trade and Growth:  
Econometric Evidence from an Extended Gravity Theory**

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# 11. ASEAN+3 and RTAs and their Impact on Asia-Australia Trade and Growth: Econometric Evidence from an Extended Gravity Theory

**Tran Van Hoa**

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## 11.1 INTRODUCTION

The recent emergence of various forms of new Asian regionalism (NAR), such as ASEAN+3 (the ten ASEAN countries plus China, Korea and Japan) and other bilateral, plurilateral and multilateral free trade agreements (FTAs) (such as Australia-US, Australia-Japan, Australia-Singapore, Japan-Singapore, Korea-Chile and the proposed ASEAN+5 (ASEAN+3 plus Australia and New Zealand)), as well as the Cotonou-type regional economic integration agreements (EIAs) advocated by the European Union (EU) in order to promote “organic” growth and “normal” opportunities (see Barker, 2002), require new research focusing upon their impact on trade and growth, as well as their viability, sustainability and future expansion.

In the specific case of Australia, its trade with Asia, especially the Asia 3 (China, Japan and Korea), has been substantial both in volume and in share over the past few decades. For example, in 2001, of Australia's total exports of \$A122.5 billion 41.1 per cent (or \$A50.4 billion) went to North Asia and 12.6 per cent to the countries of ASEAN. By comparison the share to the North American FTA (NAFTA) was only 11.2 per cent and to the EU 12 per cent (Austrade, 2003). In this context the emergence of ASEAN+3 and other FTAs or EIAs or FTAs-EIAs, with expected subsequent trade and services diversion, may have a deep impact on Australia's trade, investment, growth and, through less trade in goods and services, regional economic relations and cooperation in non-trade (such as security and stability) areas. To date, however, not much work in this area has been done and reported on the causal and quantitative significance of the factors giving rise to NARs, and

their potential impact in general (see ASEAN, 2002, and also Tran Van Hoa, 2003) or with specific reference to Asia-Australia trade in particular.

While an apparent reason for the emergence of the FTAs and EIAs mentioned above in the Asian region may be the country members' proximity (distance, size and area), other economic (for example, the 'flying geese' pattern and financial crises) and non-economic (for example, social, cultural and religious) factors may regionally and globally also play an important and interdependent part (see below). It would be more appropriate in this case to investigate the impact of NARs (for example, ASEAN+3) on our bilateral focus, Asia-Australia trade, primarily from this new and comprehensive perspective.

The chapter departs from the standard, but restrictive, CGE/GTAP method (which deals statically and only with goods trade in coverage and no econometrics) and proposes instead a new approach, with data-based quantitative and policy outcomes, to empirically validate the *raison d'être* for recent Asian FTAs, and to comprehensively investigate their potential impact on trading partners' trade. This new approach has four innovative features. First, it proposes to extend the standard gravity theory<sup>1</sup> to construct appropriate simultaneous-equation trade-growth models in flexible functional form (Tran Van Hoa, 1992a) for our three trading blocs of interest, namely, ASEAN, the Asia 3 and Australia, and their relationships. Second, it uses recent World Bank World Tables national accounts and France's CHELEM trade time-series data, and improved 2SHI estimation methodologies (Tran Van Hoa, 1985, 1986b, 1986c, 1997, and Tran Van Hoa and Chaturvedi, 1997, and Namba, 2000 and 2001) to fit these models to provide more reliable empirical evidence on trade-growth causality and historical support (or a lack of it) for the ASEAN, the Asia 3, Australia and their trade linkages. Third, based on these findings, trade and growth policy implications for these three trading blocs will be discussed and the impact of ASEAN+3 on Asia-Australia trade assessed. Finally, applications of our new modelling and impact study approach to, for example, ASEAN+5, ASEAN+India or the recent Australia-China and other regional, plurilateral or multilateral FTAs and EIAs will be briefly suggested.

The structure of the chapter is as follows. Section 2 summarizes the development of new Asian regionalism and ASEAN+3. Section 3 provides a linkage between ASEAN+3 and gravity theory and also a description of our new approach, the extended gravity theory, which will be adopted in our study of ASEAN+3 on Asia-Australia trade and growth. A simple trade-growth model is introduced in section 4 and its estimation reported in section 5. An analysis of the empirical findings is given in section 6 and implications for policy on Asia-Australia trade and growth and economic relations are discussed in section 7. Finally, section 8 summarizes the main findings.

## 11.2 DEVELOPMENT OF NEW ASIAN REGIONALISMS AND ASEAN+3

The ASEAN+3 proposal, sometimes known as the Young-Ho Kim proposal named after Korea's former Minister of Commerce who strongly supported and put it forward, was discussed in the mid- and especially late-1990s by ASEAN leaders, and implemented notably through the Hanoi Plan of Action in 1998 for ASEAN Vision 2020 (ASEAN, 2002). A number of factors can be attributed to its recent emergence. First, it was the result of decades of fast growth and a number of economic, financial and restructuring developments in North East Asia and in other major trading blocs in the world. Second, it was the result of developments and shifts in focus in North America and the EU in the aftermath of the damaging Asia crisis starting in Thailand in July 1997, and its subsequent contagion to a number of 'once miracle' economies in East and South East Asia, the former USSR, and, to a lesser extent, North and South America and the EU (Tran Van Hoa, 2000a). Third, it was the result of a benign neglect from such international organizations as the International Monetary Fund (IMF) or the economic power of North America and the EU on the plight of crisis countries in Asia, and the of lack of interest of the former in seriously helping to solve the economic, financial and social problems arising from the Asia crisis (Tran Van Hoa, 2002d).

In 2001, and early in 2002, other new developments in East and South East Asia gained prominence and assisted in giving rise to a number of new Asian economic integrations or regionalisms and Asian FTAs. These developments included the quick recovery and recurring growth in Korea, the emergence of China as a fast post-Asia crisis growing economy, and the continuing stagnant state of the world's second largest economy (namely Japan). The recent recovery and growth of Korea has also been put forward by some authors as a leader in the post-crisis 'flying geese' theory for ASEAN+3 economies (see Harvie and Lee, 2002).

The NARs and FTAs including customs unions and EIAs (which are accepted exceptions, subject to strict conditions, to the WTO principle of the Most Favoured Nations under Article XXIV of GATT and Article V of GATS) are indeed numerous and proliferating at an amazing speed at the behest of government leaders especially in the Asian region. They include plurilateral and bilateral FTAs such as first ASEAN, ASEAN+3, then ASEAN+5, ASEAN+5+Taiwan, Japan+Singapore, Japan+Korea, Japan+Mexico, Korea+Mexico+Chile, China+Japan+Korea, Singapore+New Zealand, Hong Kong+New Zealand, Australia-Japan (NARA), Australia-Singapore, and last, but not the least, Vietnam+US. Currently there is even a discussion on the setting up of a North Asian FTA in which Japan will play an important part. In mid-2003 a protocol was also being negotiated between Washington and Canberra to address key US complaints about the Australian market and to prepare for the setting up of a sweeping US-Australia FTA, as

proposed by the Australian government (Hartcher, 2002). This was to the dismay of New Zealand which wanted, on the other hand, a trilateral US-CER (Closer Economic Relations – an EIA between Australia and New Zealand). In mid-2002 there was a suggestion by New Zealand Prime Minister Helen Clark to set up ANZEC (Australia-New Zealand Economic Cooperation) to boost the low-activity 20-year old CER. An Australia-Thailand CER Agreement – the first between Thailand and a developed country – was also proposed in mid-2003 (DFAT, 2004). The EU has also been strongly advocating regional integration and liberalization for the Pacific nations to create EU-type transnational economic partnerships (an EIA) within the Cotonou framework, to stimulate trade and create growth among them (Barker, 2002).

The main focus and objective of the NARs and Asian FTAs (as separate from currency or customs unions and EIAs) is to promote trade and living standards either among the Asian economies themselves or with the membership of other economies outside Asia such as the US, Mexico and Chile in the Americas, and Australia and New Zealand in Oceania. Prominent among these NARs and Asian FTAs is the ASEAN+3 proposal above and, part of it, the ASEAN+1 or ASEAN+China FTA with a 1,700 million people market, a US\$2 trillion GDP, and trade worth US\$1.2 trillion. ASEAN+China was endorsed by the ten leaders of ASEAN in Brunei in November 2001, and its details were worked out at a negotiating meeting in Beijing in May 2002.

### 11.3 ASEAN+3, OTHER FTAs AND GRAVITY THEORY

Since the primary objectives of FTAs are trade liberalization and welfare improvement, as well as economic partnerships generally, for member countries, the FTA premises that directly-trade (international and domestic) and indirectly other determinants of trade significantly and causally affect economic welfare (see Raimondos-Moller and Woodland, 2002); real wages (see Ruffin and Jones, 2003); growth (for developed countries see Frankel and Rose, 1998, Frankel and Romer, 1999); and development (for developing countries, see Harrison (for all countries), 1996, Frankel et al. (for ten East and South East Asian countries), 1996, and Tran Van Hoa (for ASEAN, China, Korea and Japan), 2002a). The outcomes are also mutually beneficial in many other non-economic aspects (e.g. closer regional and international cooperation and collaboration, social harmony, political stability and prosperity), and, in the context of globalisation and enhancing international competitiveness, conducive to regional or international economic integration (ASEAN, 1999).

In view of the expectation that FTAs will enhance trade and produce final outcomes of higher growth and higher real wages or better economic development improvement for trading partners or FTA member countries, a useful causality concept in the form of a gravity theory using geographical,

demographic and other common or concurrent attributes (see for example Linneman, 1966 and the specification in Table 3 in Frankel et al., 1996) to explain trade flows (liberalization) between countries may be appropriate in empirical studies of this trade-growth nexus (for another more restrictive justification, see Rose, 2000). Some extensions to this theory's determinants using OECD country data have also been attempted to deal with trade correlations and output fluctuations (see for example, Otto et al., 2002). The data used in these seminal studies of the gravity theory have been singularly cross-sectional.

In the case of Asian economies, especially member countries in the ASEAN+3 FTA, and their impact in a bilateral Asia-Australia trade context, which is the focus of this study, not much research either of a qualitative or quantitative kind has been conducted or reported. Neither has much been done on the validity of the required premises underlying the foundation of this ASEAN+3 FTA (namely, given their regional proximity but diverse culture, history, religion and development components, does more trade cause higher growth in the member countries and over time?) and its trade linkage to Australia's exports and imports of goods and services.

### 11.4 A TRADE-GROWTH MODEL FOR STUDY OF ASEAN+3 AND ASIA-AUSTRALIA TRADE

Consider, for convenience and without loss of generality, a simple model of two simultaneous implicit functions (extension to more functions is straightforward when more variables are considered and endogenized) comprising and extending the basics of the standard cross-section-data-based gravity theory linking trade and growth between two trading countries or blocs. This extended gravity theory may comprise geographic or demographic attributes (for ASEAN, its neighbouring Asian 3 and Australia), economic factors, and the requirements of a regional FTA or EIA. Since the geographical attributes (such as distance and area) in the ASEAN+3 and Australia region are *a priori* assumed to be a rationale for setting up ASEAN and ASEAN+3, we can then focus on other relevant demographic (e.g. population as a proxy for size – see Frankel and Romer, 1999), economic and non-economic determinants of trade and growth in our model.

In this model, trade (named T) may be defined as exports or imports or openness (exports plus imports) and may include domestic trade (Frankel and Romer, 1999), and growth (Y) may be defined as GNP or, by more popular convention, GDP. The two countries may be comprehensively all possible pairs of the 13 ASEAN+3 members and Australia or, more specifically and within the interest of our present study, as pair-wise (bilateral) combinations of ASEAN-Australia and Asia 3-Australia. Thus

$$F1(\alpha, Y, T) = 0 \quad (11.1)$$

$$F2(\beta, T, Y, X, W) = 0 \quad (11.2)$$

where F1 and F2 are two arbitrary functionals linking trade and growth and their theoretically plausible determinants,  $\alpha$  and  $\beta$  are parameter vectors, X and W denote, respectively, other economic (fiscal, monetary, trade and industry policy – see Sala-i-Martin, 1991) and non-economic (e.g. distance, area, size, policy shifts and external shocks – see Johansen, 1982) variables, relevant to a country or a group of countries' growth or development. Importantly, for our study, in addition to T and Y data for X and W must be available and consistent with published time-series data in a standard Kuznets-type accounting framework (e.g. SNA93), or the accounting system of Stone (1988), or the recent World Bank World Tables.

Taking the total differentials of (11.1) and (11.2), and neglecting terms of second and higher-order (see for example Allen, 1960 and Tran Van Hoa, 1992a), the 2-equation model (11.1)–(11.2) can be written in stochastic form and in terms of the rates of change ( $Y\%$ ,  $T\%$ ,  $X\%$  and  $W\%$ ) of all the included econometrically exogenous and endogenous variables ( $Y$ ,  $T$ ,  $X$  and  $W$ ) as:

$$Y\% = \alpha_1 + \alpha_2 T\% + u_1 \quad (11.3)$$

$$T\% = \beta_1 + \beta_2 Y\% + \beta_3 X\% + \beta_4 W\% + u_2 \quad (11.4)$$

In (11.3)–(11.4), the equations are linear and interdependent in the sense of Marshall or Haavelmo,  $\alpha$ 's and  $\beta$ 's are the elasticities, and  $u$ 's other unknown factors outside the model (Frankel and Romer, 1999) or disturbances with standard statistical properties. In (11.3)–(11.4) circular and instantaneous causality in the sense of Granger (1969) or Engle-Granger (1987) exists or is regarded as a testable hypothesis. In their non-stochastic forms (in which all disturbances are idealistically zero), these equations form the basic structure of the applied or computable general equilibrium (CGE/GTAP) models of the Johansen class, in which all elasticities are usually assumed to be given or known *a priori* and the impact of endogenous or endogenized variables (say  $T$ ) on  $Y$  is dependent on the exogenous variables and calculated system-wise using such iterative procedures as the Gauss-Euler algorithm with a known sparse matrix of elasticities.

It can be verified that our so-called flexible (or function-free) trade-output growth equation (11.3) in the model above is econometrically identified in the sense of mathematical consistency. An impact study of endogenous trade (or exogenous  $X$  and  $W$ ) on growth can be analysed directly via its 2SLS (or reduced-form adjusted) form structurally given in (11.5) below or indirectly via its reduced form given in (11.6) in terms of all the exogenous economic

and non-economic variables in the model. It is well known in the theory of econometrics that the use of OLS to estimate equation (11.3) for example will, in this case, produce biased parameter estimates. These two equations can be written as

$$Y\% = \alpha_1 + \alpha_2 \tilde{T}\% + v_1 \quad (11.5)$$

$$Y\% = p_1 + p_2 X\% + p_3 W\% + v_2 \quad (11.6)$$

where  $\tilde{T}$  is  $T$  as estimated by the OLS of its reduced form equation (that is (11.6) with  $T\%$  replacing  $Y\%$ ) and  $v$ 's the new disturbances with standard statistical properties.

An important feature of our modelling approach is that, contrary to the CGE/GTAP restrictive (goods only) and *a priori* approach, our impact study is data-consistent as all required elasticities are estimated from available data and have asymptotically and statistically desirable and consistent (an important issue in the gravity theory's empirical applications – see Frankel and Romer, 1999) properties when suitable estimation and forecasting methods (e.g. 2SLS or other instrumental variables (IV) methods) are employed. Another important feature is that, contrary to other SNA93-based or Keynesian approaches, our impact study has the general flexibility in modelling specification rationale and implementation in assuming explicitly no *a priori* functional forms for the equations in the model, and it can handle data on trade or budget deficits and real rates of interest when inflation exceeds the nominal interest rate. The usual method of routine log transformations for all variables in an econometric model cannot do this.

To implement the model, equations (11.3)–(11.4) above, to empirically investigate the causal relationship between, for example, trade and growth in the ASEAN, the Asia 3 and Australia, we can use, given fixed geographical components (distance and area) as discussed, and, for time-series data, population (a proxy for size), conventional economic determinants of trade (see for example Frankel and Rose, 1998, Frankel and Romer, 1999, Rose, 2000, and Otto et al., 2002) and/or other relevant factors (e.g. external or internal shocks – Johansen, 1982) when such data are available. One such extended model relevant to our focus of study on the possible causality (impact) between Australia trade and the ASEAN or the Asia 3 may be written in either the reduced-form adjusted equation (11.7), and supplemented by the full reduced-form equation for  $T$  (11.8) (and similarly for growth  $Y$ ) as:

$$Y\% = \alpha_1 + \alpha_2 \tilde{T}\% + \alpha_3 ST + v_1 \quad (11.7)$$

$$T\% = p_1 + p_2 Y\% + p_3 FT\% + p_4 MT + p_5 PT + p_6 ERT \\ + p_7 IT + p_8 POT + p_9 ST + v_2 \quad (11.8)$$

In equations (11.7)–(11.8), Australian trade ( $T\%$ ) with its Asian trading partner (ASEAN or the Asia 3 or both) for example is assumed to cause, together with  $ST$  (external and internal shocks), Australian growth ( $Y\%$ ) but this trade is also affected by economic activities, trade-related policies and external or internal shocks in Australia and its trading partner (either ASEAN or the Asia 3 or both). Assuming, for convenience, that Australian trade (traditionally defined as its exports (or imports, see Barro and Helpman, 1991)) with its trading partner is affected by this partner's GDP and other major economic activities, trade-related policies (see Coe and Helpman, 1993 for this approach) or external or internal shocks in its trading partner, then Equation 11.8 in its reduced form simply assumes that Australia's partner's trade is affected by the exogenous factors such as GDP (named  $YT$ ), inflation (PT) – see Romer (1993), fiscal policy (FT), monetary policy (MT), trade policy and exchange rates (ERT) – see Rose (2000), industry structure (IT) – see Otto et al. (2002), population (POT) – see Frankel and Romer (1999), and internal or external shocks (ST) – see Johansen (1982) – of its trading partner.

In deriving equations (11.7) and (11.8) for two trading countries or blocs, we assume that Country 1's trade affecting its growth is a testable hypothesis and this trade itself is essentially a demand equation for either imports (from Country 2) and exports (to Country 2) or vice versa or both. For the economies of the ASEAN and the East Asia 3, geographic attributes (that is, being in the neighbouring region) are assumed to be the *prime facie* reason for setting up the ASEAN+3, and the distance and area characteristics are omitted as all of our variables are expressed in terms of time-series (distance and area may also not be appropriate even for cross-section studies with high-trade countries like Singapore and Brunei in ASEAN+3). All variables in the model, that is,  $Y$ ,  $T$ ,  $YT$ ,  $FT$ ,  $MT$ ,  $PT$ ,  $ERT$ ,  $IT$  and  $POT$  are expressed as their rates of change so the units of measurement for the trading countries' variables are irrelevant.  $ST$  is a qualitative time-series variable representing shocks having either one-off effects or temporally permanent effects (autoregressive and non-stationary) on trade and growth with discrete values.

The implications of our model above are important for studying the transmission mechanism, or relationship, between trade and growth of the ASEAN, the Asia 3 and Australia, and their trade linkages. This relationship, if empirically substantiated, can provide powerful evidence on the trade, investment and welfare enhancement relationship of these countries as trading partners. It would also lend crucial support for the viability, sustainability and promising prospects of the new Asian regionalism, namely, ASEAN+3 (or other FTAs), as well as providing empirical evidence for quantifying its impact on Asia-Australia trade and suggesting robust and credible trade policy.

## 11.5 ALTERNATIVE ESTIMATION AND FORECASTING METHODS

The importance of using a suitable estimation method for our model (or similar models) to get more accurate or unbiased results has been emphasized in previous trade-growth studies using standard gravity theory (see for example Frankel and Romer, 1999). These studies deal mainly with the OLS and IV (instrumental-variables) estimation methods. In this section, we briefly survey the various new and improved estimation and forecasting methods that are available. Their appropriate use can produce more accurate econometric outcomes on the trade-growth causal relationship, and subsequently on economic and trade policies and regional integration.

More specifically, in our model, the equations in differential and reduced form as given in equation (11.8) for  $Y\%$  (or, similarly, for  $T\%$  to provide  $\dot{T}\%$  in equation (11.7)) can be written more generally with a sampling size  $T$  and  $k$  independent variables (possible causal components) in matrix notation as:

$$y = Z\beta + u \quad (11.9)$$

$$(Tx1)(Txk)(kx1)(Tx1)$$

where  $y = Y\%$ ,  $Z =$  the rate of change of the exogenous and predetermined variables (both static and dynamic),  $\beta =$  the parameters, and  $u$  the disturbance satisfying all standard statistical assumptions.

We now define our evaluation criterion (in terms of average MSE or Wald risks) for an arbitrary estimator  $\hat{\beta}$  a for  $\beta$  in equation (11.9) as Wald risk  $\equiv \text{MSE}(\hat{\beta} a) = (\hat{\beta} a - \beta)' W (\hat{\beta} a - \beta)$  where  $W$  is a positive definite. Under Wald risks we can estimate equation (11.9), which is essentially a general linear model for structural or behavioural analysis or for direct forecasting and policy studies (see Pindyck and Rubinfeld, 1998), by using OLS or, at a more statistically efficient level, any of the explicit (Baranchik, 1973) Stein or Stein-rule methods as described below.

More specifically, using equation (11.9), the basic and most well-known and used method to produce estimates and forecasts of  $y$  (or  $Y\%$ ) is the OLS estimator of  $\beta$  (denoted by  $\hat{\beta}$ ), and written as

$$\hat{\beta} = (Z'Z)^{-1}Z'y \quad (11.10)$$

A more efficient method is the explicit Stein estimator of  $\beta$  (Baranchik, 1973) and given by

$$\begin{aligned}\hat{\beta}_s &= [1 - c(y-Zb)(y-Zb)'b'Z'b] \hat{\beta} \\ &= [1 - c(1-R^2)/R^2] \hat{\beta}\end{aligned}\quad (11.11)$$

where  $c$  is a characterizing scalar and defined in the range  $0 < c < 2(k-2)/(T-k+2)$ , and  $R^2$  is the square of the sample multiple correlation coefficient.

A still more efficient method (to avoid, in one respect, implausible results derived from plausible OLS parameter estimates) is the explicit positive-part Stein estimator of  $\beta$  (Anderson, 1984). This estimator is defined as

$$\begin{aligned}\hat{\beta} + s &= [1 - \min\{1, c(y-Z\hat{\beta})(y-Z\hat{\beta})'Z'Z\hat{\beta}\}] \hat{\beta} \\ &= [1 - \min\{1, c(1-R^2)/R^2\}] \hat{\beta}\end{aligned}\quad (11.12)$$

A new method to obtain estimates and forecasts of  $\beta$  in equation (11.9), with better properties in Wald risks, has been proposed (see Tran Van Hoa, 1985, Tran Van Hoa and Chaturvedi, 1988, 1990, 1997). It is in a class of explicit improved Stein-rule or empirical Bayes (also known as the two-stage hierarchical information or 2SHI estimators for linear regression models). This estimator includes the explicit Stein and the double k-class (Ullah and Ullah, 1978) estimators as subsets (Tran Van Hoa, 1993a). Other applications of the Stein, Stein-rule, and 2SHI estimators to linear regression models with non-spherical disturbances and to Zellner's seemingly unrelated regression model have also been made (see Tran Van Hoa et al., 1993, in the case of regressions with non-spherical disturbances, and Tran Van Hoa, 1992b, 1992c, and 1992d, in the case of seemingly unrelated regressions).

The explicit 2SHI estimator is a *bona fide* or fully operational (in statistical theory terminology) estimator, and defined as

$$\hat{\beta}_h = [1 - c(1-R^2)/R^2] - c(1-R^2)/\{R^2(1+c(1-R^2)/R^2)\} \hat{\beta}\quad (11.13)$$

and its positive-part counterpart (Tran Van Hoa, 1986a) is given by

$$\hat{\beta} + h = [1 - \min\{1, c(1-R^2)/R^2\} - \{1/((R^2/c(1-R^2)) + 1)\}] \hat{\beta}\quad (11.14)$$

While all the estimators given above can be applied to the general linear model equation (11.9) for structural and forecasting analysis, their relative performance in terms of historical, *ex post* or *ex ante* (Pindyck and Rubinfeld, 1998), forecasting of MSE can differ. Thus, it is well known that, in MSE and for  $k \geq 3$  and  $T \geq k+2$ ,  $\hat{\beta}_s$  dominates (that is, it performs better in forecasting MSE)  $\hat{\beta}$ , and  $\hat{\beta}_s$  is dominated by  $\hat{\beta} + s$  (Baranchuk, 1973,

Anderson, 1984). However, it has also been demonstrated (Tran Van Hoa, 1985, Tran Van Hoa and Chaturvedi, 1988) that, in MSE,  $\hat{\beta}_h$  dominates both  $\hat{\beta}$  and  $\hat{\beta}_s$ , and more importantly,  $\hat{\beta} + h$  dominates  $\hat{\beta} + s$  (Tran Van Hoa, 1986a).

A further important result of the 2SHI theory has recently been proved (see Tran Van Hoa and Chaturvedi, 1997): *the dominance of the 2SHI over the OLS and Stein exists anywhere in the range*  $0 < c < 2(k-1)/(T-k)$ . This indicates that the 2SHI produces better (in terms of smaller Wald risk or generalized Pitman nearness) estimates and forecasts even if the estimating and forecasting equation has only one independent variable in it. *The condition for the optimal Stein dominance in the linear equation up to now requires that*  $0 < c < 2(k-2)/(T-k+2)$  (see Anderson, 1984). Further, MSE-dominance properties of the 2SHI estimators, and their extensions over the positive-part Stein estimator in regression equations, have been given by Namba (2000, 2001).

## Remarks

First, since one of the best known IV estimators, namely the 2SLS, has been demonstrated to be dominated in MSE by the 2SHI in errors-in-variables models and in identified structural equations of simultaneous-equations models (see Tran Van Hoa, 1986b and 1986c) such as equation (11.7), the so-called IV (see Frankel and Romer, 1999) impact of the trading partner's (say ASEAN) trade on Australia growth can be directly studied via the application of the 2SHI to equation (11.7).

Second, while some application of the 2SHI forecasting methods to predictions of economic activities in some developed countries such as Australia (see Tran Van Hoa, 1992d) has been made, these methods have not been investigated explicitly within an open trade-growth theoretical framework and an empirical context using more recent economic data for the major economies in ASEAN and the Asia 3. This issue is taken up in the study below for some of the fastest growth economies, or group of economies, in the world in recent years (even after the Asia crisis of 1997), but with highly fluctuating investment and being very sensitive to foreign trade and capital flows in the region (see Tran Van Hoa and Harvie, 1998).

Third, an interesting feature of our study is that the 2SHI estimators are finite-sample estimators (which converge to the OLS or 2SLS when  $T \rightarrow \infty$ ) with optimal MSE properties (see above). Since all time-series data used here are necessarily annual and have, as usual, a small sample size, the study outcomes are therefore finite-sample optimal.

Finally, it has been demonstrated that the 2SHI dominates other conventional estimators when measurement errors exist (Tran Van Hoa,



1986b). Since the poor quality of economic data from the Asian countries and other less developed country economies is well known, one by-product of our study is that the findings are also optimal in errors-in-variables cases.

## 11.6 SUBSTANTIVE EVIDENCE ON ASEAN, ASIA 3 AND ASEAN+3 TRADE ON AUSTRALIAN GROWTH

This section reports substantive results for a number of trade-growth simultaneous-equation models which are based on several plausible extensions to the standard gravity theory: such as planar approximation to any arbitrary functionals (see below), to time-series data, and incorporating micro/macro factors and shocks, and given in equations (11.7) and (11.8) above. For comparison with the findings of previous studies in standard gravity theory applications, these results are obtained by the OLS, 2SLS and 2SHI for the structural equation of growth, equation (11.7).

### Data

Due to data limitations for our studies, especially dealing with developing economies, all original data are obtained as annual and then transformed to their ratios (when appropriate). The ratio variables include trade (exports and imports), government budget, and money supply (M2) all divided by GDP, and labour force divided by population. Other non-ratio variables include exchange rates, population and binary variables representing the occurrence of the economic, financial and other major crises over the period 1961 to 2001. All non-binary variables are then converted to their percentages. The use of this percentage measurement is a main feature of our modelling and impact approach and avoids the problem of *a priori* known functional forms (see above) and also of logarithmic transformations for negative data (such as budget (fiscal) or current account deficits). As the average micro/macroeconomic data for the countries in the ASEAN and the Asia 3 as two regional trading blocs are difficult (if not impossible) to measure, we have reversed the direction of trade below in a "dual ASEAN trade to Australia or, equivalently, Australia trade to ASEAN" context and used Australia as the trading partner of ASEAN and the Asia 3 instead.

The data for regional (e.g. ASEAN and the Asia 3) and national (e.g. Australia) trade (exports (X) to and imports (IM) from, respectively), GDP and estimated mean population (named POP) are retrieved from France's 2001 CHELEM international trade databases. Openness between two trading countries is defined as  $T=X+IM$  although the separate effects of either X or IM have been experimented with (see below). All trade and economic data are at current prices. Fiscal, monetary, trade and industry policy data for

Australia was obtained from the 2003 OECD database and approximated, respectively, by government budget/GDP (BUR), M2/GDP (M2R), exchange rates per US dollar (ER), and the unemployment rate (or 1-employment/labour force) (UR). In addition to the usual demographic and economic components in our model, we also identified five major world crises that had affected the ASEAN and Asia 3 economies (and other economies) during our sampling period and included them as five dummy variables with persistent effects after their occurrence (one-off effects were postulated but discarded as implausible in the study). These are the first oil crisis of 1975 (named C75), the stock market crash of 1987 (C87), the China turmoil (C89), the Gulf War of 1991 (C91), and the Asia crisis of 1997 (C97). Various modelling experiments in our study also show that these crises all have a permanent or non-decayed effect on growth in ASEAN and the Asia 3.

### The Estimated Models

The various bilateral trade-growth models for the ASEAN and the Asia 3 trading with Australia are based on these data. The 2-simultaneous equation trade-growth model for ASEAN and Australia in our studies, for example that based on equations (11.7)-(11.8), can be written fully for estimation and impact analysis as:

$$YA\% = \alpha_1 + \alpha_2 TOZ2A\% + \alpha_3 C75 + \alpha_4 C87 + \alpha_5 C91 + \alpha_6 C97 + v1 \quad (11.15)$$

$$TOZ2A\% = \beta_1 + \beta_2 YOZ\% + \beta_3 BUR\% + \beta_4 M2R\% + \beta_5 IPD\% + \beta_6 ER\% +$$

$$\beta_7 UR\% + \beta_8 POP\% + \beta_9 C75 + \beta_{10} C87 + \beta_{11} C91 + \beta_{12} C97 + v2 \quad (11.16)$$

where, in percentages, YA = ASEAN's GDP, TOZ2A = Australia's total trade (exports + imports or openness) with ASEAN, and YOZ = Australia's GDP. The variables BUR, M2R, IPD, ER, UR and POP denote, respectively, fiscal, monetary, inflation, exchange rate, industry policy and population in Australia. The v's are the disturbances representing other unknown factors but with effects on YA and TOZ2A respectively (see Frankel and Romer, 1999 for this rationale). The trade-growth models for the Asia 3 and Australia can be similarly constructed.

### The Empirical Findings

Two sets of empirical findings for two trade-growth models, based on equations (11.15)-(11.16) above for ASEAN-Australia, Asia 3-Australia and ASEAN+3-Australia, are given in Table 11.1. Since the estimation methods

used can provide greatly different results even for the same model (see further detail in Frankel and Romer, 1999), and also for the purpose of statistical efficiency comparison, three types of estimated structural parameters have been calculated for each model. These are the OLS, the 2SLS and the 2SHI (applied on the 2SLS). For testing the hypothesis, the 2SHI has approximately the same asymptotic properties as OLS and 2SLS.

From the results given in Table 11.1, we note three important findings. First, while having high success in modelling output growth is difficult, all three estimated models of Australia growth *vis-à-vis* ASEAN, Asia 3 and ASEAN+3 trade have statistically significant and higher modelling performance (that is,  $R^2$  reaching up to 88 per cent) relative to other trade-growth causality models as reported in previous international studies. A graph of the observed and estimated Australia growth fluctuations in the ASEAN-Australia, Asia 3-Australia and ASEAN+3-Australia models for the period under study (1971-99) also indicate that the peaks, troughs and turning points of Australia growth are accurately predicted for most of the period under study. All estimated models also appear free from serious autocorrelation-induced inefficiency problems. Second, trade, as defined by total trade/GDP between ASEAN, the East Asia 3 and ASEAN+3 *vis-à-vis* Australia, has mixed results. With the Asia 3-Australia model, it has a positive but insignificant impact on Australia growth in terms of the OLS, but it has a negative and also insignificant impact on this growth in terms of the 2SLS and 2SHI. For the ASEAN-Australia model, trade, as defined, has a positive impact on Australia growth, but only the 2SLS and 2SHI show a statistically significant effect (at the 15 per cent significance level for both the 2SLS and 2SHI). For the ASEAN+3-Australia models, trade has no significant positive effect on Australia growth. Third, for all models, the impact of the oil crisis of 1975, the stock market crash of 1987, and the China turmoil in 1989, all have a uniformly and statistically significant negative impact on Australia growth. Surprisingly, the Gulf War and the 1997 Asia economic and financial crisis reveal a large (up to 2.17 per cent), positive but non-significant impact on Australia growth in all three models.

In modelling experiments to verify the use of other definitions of trade (see above), we decomposed total trade into ASEAN, Asia 3 and ASEAN+3 imports from their trading partner (i.e., Australia exports) and Australia's imports from its trading partners (i.e. ASEAN, Asia 3 and ASEAN+3 exports to Australia) separately and included them in the growth-trade equation (11.15). The empirical findings (which are based only on 1971-97 available data) for the impact of these Asian imports and exports on Australia growth

Table 11.1 Impact of ASEAN, Asia 3 and ASEAN+3 trade on Australia growth and openness extended gravity theory in flexible structural form 1971 to 1999

Variables	ASEAN-Australia			Asia 3-Australia			ASEAN+3-Australia		
	OLS	2SLS	2SHI	OLS	2SLS	2SHI	OLS	2SLS	2SHI
Constant	16.30**	15.86**	13.83**	16.49**	16.68**	15.55**	16.43**	16.53**	14.57**
Openness/GDP	0.04	0.11@	0.10@	0.01	-0.02	-0.02	0.03	0.01	0.01
Oil Crisis 75	-4.24**	-3.91**	-3.41**	-4.40**	-4.52**	-4.21**	-4.35**	-4.42**	-3.90**
Stock Crash 87	-1.30	-2.08	-1.82	-0.80	-0.85	-0.79	-0.84	-0.82	0.72
China Turmoil 89	-7.82**	-7.43**	-6.48**	-8.20	-7.64**	-8.03**	-7.91**	-8.03**	-7.08**
Gulf War 91	1.77	1.50	1.31	1.82	2.14@	2.00	1.72	1.89	1.67
Asia Crisis 97	1.20	2.17	1.89	0.69	0.28	0.26	0.83	0.65	0.57
$R^2$	0.78	0.76	0.87#	0.77	0.76	0.88#	0.77	0.77	0.88
F	13.12**	12.12**	24.54**	12.50**	11.33**	25.67**	12.58**	12.51**	26.89**
DW	1.96	2.16	1.51	1.77	1.85	1.31	1.77	1.80	1.35

Notes: \*\* significant at the 5% level, \* significant at the 10% level @ significant at the 15% level, # correlation coefficient between Australia growth and its estimate by 2SHI. Tests on 2SHI estimates are based on their asymptotic properties as  $T \rightarrow \infty$ .

Sources of data: World Bank (2002), CHELEM International Trade Data (2001).

for the three models of ASEAN-Australia, Asia 3-Australia and ASEAN+3-Australia are given in Table 11.2. The findings are reported for OLS, 2SLS and 2SHI.

The first observation from Table 11.2 is that, in terms of the modelling performance ( $R^2$ ) of the 2SLS estimation, all three estimated models with separate exports and imports are slightly more successful than the models with total trade or openness (with  $R^2$  reaching up to 89 per cent). More specifically, while the predictions of peaks, troughs and turning points are still fairly accurate and serious serial correlation is absent in these models, the impact of Australia imports from the ASEAN, Asia 3 and ASEAN+3 regions is not only small in magnitude but also an insignificant contribution to Australia growth. In contrast, while the impact of Australia exports to the Asia 3 and ASEAN+3 seems again small and insignificant, its exports to the ASEAN contribute a larger and significant impact on Australia growth. The oil shocks of 1975 and the China crisis of 1989 both have negative and significant effects on Australia growth. While the 1987 stock market crash effects are negative for all three models, they are statistically significant only for the ASEAN-Australia case. The impact of the Gulf War on Australia's economic health is surprisingly positive but statistically negligible.

### 11.7 ECONOMIC AND TRADE POLICY IMPLICATIONS FOR AUSTRALIA FROM AN ASEAN, ASIA 3 AND ASEAN+3 FTAs

While the models we used for study above may be simple in their structure, they contain the main and conventional ingredients of trade-growth analysis and are fairly consistent with similar previous studies for comparative purposes. The empirical findings reported in the preceding section also provide a number of interesting results on trade-growth causation with important international trade or cooperation policy implications for Australia, and with the economies of ASEAN+3 in particular or with other regional and international economic integrations with similar interest and objectives in general. Some of our findings may be useful in providing significant evidence and information for trade-growth analysis, discussions and policy consideration. In addition, while some of the previous trade-growth analysis is based purely on cross-section data or a mix of panel data, our studies are based completely on time-series data due to our interest in economic development in the Asian region and its potential impact on Australia in recent years. These two approaches of gravity analysis are, however, complementary.

Table 11.2  
Impact of ASEAN, Asia 3 and ASEAN+3 trade on Australia growth export and imports  
extended gravity theory in flexible structural form 1971 to 1997

### Do ASEAN, Asia 3 and ASEAN+3 Trade Cause Australia Growth?

Trade-to-growth is an important causal topic in economics that has attracted some of the best minds in the field over the last ten years or so (see for example Frankel and Romer, 1999, for a survey), and the conclusions have not been finalized for all cases. Our results above show that in the specific case of ASEAN, Asia 3 and ASEAN+3 *vis-à-vis* their trading partner in the Asia Pacific region, namely Australia, their trade, when defined as its relative size of openness or simply their exports to Australia, has at best only weak empirical support as a significant and positive determinant of Australia growth. Australia exports to these three major Asian regions, however, appear to be a significant contribution (especially in the case of exports to the ASEAN) to its growth. Interestingly, this weak contribution is found to be much stronger (by more than 100 per cent) in the case of the methodologically more acceptable 2SLS and 2SHI than the OLS with its well-known Haavelmo or simultaneous-equation bias. The weak evidence may be explained by the fact that advanced countries, such as Australia and the US, are essentially services economies, and they are less likely to be significantly affected by trade in goods only as used in this study. The dominance of exports in Australia growth may also be explained by the fact that Australian exports to Asia are mainly of primary and non-manufactured tradeable goods.

### Do Crises Affect Australia Growth?

When openness is used as a proxy for trade between ASEAN, the Asia 3 and ASEAN+3, crises such as the 1975 oil shocks, the stock market crash of 1987, and the China internal turmoil of 1989 all do appear to affect Australia growth. Other major crises such as the Gulf War and the 1997 Asia meltdown have no adverse effect on this growth. When decomposed trade is used, however, the Asia crisis of 1997 and the 1989 China political turmoil are found to be the only factors that have exerted a strong and uniform declining impact on Australia growth in all three models. This finding would support the view of "The Asia crisis. What crisis?" in some sections (for example, the Melbourne Institute) of the Australian economic community (see Tran Van Hoa, 2000b). Another derived conclusion is that a contemporary trade-growth model for ASEAN+3 (or even for other regions or countries) studies, without the inclusion of these recent shock factors (as implied by Frankel and Romer, 1999, or stipulated by Johansen for policy analysis, 1982), may have serious and biased results on the causation being explored.

### Are Trade-Growth Causation Results Affected by Estimation Methods?

In previous studies of trade-growth, OLS results of trade-growth models based on the gravity or similar theory seem to indicate an underestimation of the trade effect. IV estimates of the trade effect are usually found to be larger in general than OLS estimates. This is supported in our ASEAN-Australia and Asia 3-Australia models using either openness or imports and exports but not in the ASEAN+3-Australia model. Four reasons have been put forward to support the underestimation of the OLS and two explanations for the overestimation of 2SLS (see Frankel and Romer, 1999, for a brief survey). In our studies using openness, the underestimation of the OLS is found for the trade effect in the ASEAN-Australia and Asia 3-Australia models, but the reverse is found for the ASEAN+3-Australia case. In studies with decomposed trade, however, the 2SLS (and 2SHI) estimated impact is larger than that of the OLS for all three models and only in terms of Australia exports to the ASEAN and Asia 3. For Australia imports from Asia the OLS-based trade elasticities are uniformly larger than their 2SLS (and 2SHI) counterpart in the Asia 3-Australia and ASEAN+3-Australia models.

It is well known from the bias  $-\beta\text{Cov}(Vu)$  of the OLS in errors-in-variables models (that is,  $y = \beta X^* + u$ , but  $X^*$  is unobserved and proxied by observed  $X$  with  $X = X^* + V$ , where  $V$  is measurement errors) or, equivalently, simultaneous-equation models, that the specification of the model or the instruments (as captured through  $\text{Cov}(Xu)$ ) solely determines a downward or upward bias of the OLS. In our view, it is the nature of the model and the characteristics of the instruments and collected data that determine the estimation bias. A general conclusion may not be made in this case.

When we are focused on higher efficiency for the estimates of the models that are subject to misspecification (e.g. omitted relevant variables) or measurement errors or simultaneity bias, then the 2SHI estimates should be used. In this case the impact based on the OLS and 2SLS is overestimated and that on the 2SHI should be used. The smaller MSE estimates of the trade impact as obtained by the 2SHI and compared to the 2SLS, are given for all models in Tables 11.1 and 11.2.

### Are Reduced-form Estimates of Trade a Good Proxy for Trade in our Models?

This is a question on the accuracy and reliability of the trade-growth model and the instruments used (a point often raised in the literature, see Frankel and Romer, 1999). The answer, in this case, has to be relative, as different models will have different instruments and therefore different accuracy or reliability outcomes. To answer this question for our models, we have calculated the proxy for  $T$ , namely  $\bar{T}$ , from its reduced form for each of the

estimations requiring a knowledge of  $\hat{T}$ . Standard evaluation criteria such as the correlation coefficient and the Theil-MSE-decomposition  $Um$  (bias),  $Us$  (variation) and  $Uc$  (covariance) are then used to evaluate the proxy performance of  $\hat{T}$  as compared to its actual  $T$  in each model reported in Table 11.1. The results of this evaluation are given in Table 11.3.

We note first from Table 11.3 that, as in the earlier cases, with Australia growth modelling, the  $\hat{T}$  fairly accurately emulates all troughs, peaks and turning points of the actual  $T$  in all three models - ASEAN-Australia, Asia 3-Australia and ASEAN+3-Australia. In addition, the results indicate that, according to the evaluation criteria reported in Table 11.3, the  $\hat{T}$  seems to be a very good estimated proxy to  $T$  in all models. This finding would enhance the robustness of our 2SLS estimation of the impact of Asian trade on Australia growth and related policy recommendations.

### Do We Have Empirical Support for the ASEAN+5 FTA Proposal by Australia and New Zealand?

The ASEAN+5 (that is, ASEAN+3 plus Australia and New Zealand) proposal has been strongly supported by Australia and New Zealand within the context of regional economic integration in recent years, but, so far, has been rejected by some members of the ASEAN. As we have mentioned earlier the objectives of setting up an ASEAN+5 FTA are, in addition to better regional cooperation and stability, to enhance trade between its fifteen members and to improve their welfare. These objectives necessarily require that trade does in fact directly and positively affect growth. Our findings reported above (even for Australia only) lend ample support to the hypothesis that trade between the three Asian FTAs and Australia provides only a weak contribution to Australian growth. The implications are, based on our findings, that an ASEAN+5, for example, would therefore serve more a regional political cooperation agenda because of geographical gravity or closeness than a genuine economic and trade objective of mutual benefit.

### Implications for Asia-Australia Trade Policy

The above conclusions appear to indicate that Australian trade, and especially crises, are important factors for Australian growth. More specifically, trade (exports) from Australia to the three Asian regions (especially the ASEAN) is the more important contribution. Since the Asia 3 is known to be more competitive, in terms of development stages, advanced technology, comparative advantages, and size, than the majority of the ASEAN, our findings on Australian growth being dependent more on ASEAN trade seems to be an interesting consideration for further study in Asia-Australia trade policy analysis. A good trade or integration policy emanating from ASEAN

towards Australia, or vice versa, should take this into account.

Table 11.3 Reliability of the Trade Proxy in 3 Asia-Australia trade growth models - openness (exports+imports)/GDP - 1971 to 1999

Model	ASEAN-Australia (1971-1998)	Asia 3-Australia (1971-1998)	ASEAN+3-Australia (1971-1999)
Correlation			
Coefficient	0.74	0.74	0.76
RMSE	7.87	4.82	4.64
Mean Error	0.00	0.00	0.00
$Um$	0.00	0.00	0.00
$Uc$	0.15	0.15	0.14
$Us$	0.85	0.85	0.86

Notes:  $Ub+Us+Uc = 1$ . See Pindyck and Rubinfeld (1998) for further detail on these evaluation criteria. The estimates are based on TSP.

### Implications for Australian Growth and Asian Regional Cooperation

In our earlier study (Tran Van Hoa, 2002a) it was pointed out that while trade between the Asia 3 or ASEAN members and other trading blocs (e.g. NAFTA and EU) reflects an important historical trend in the past thirty years or so, the composition of trade by tradable commodities is also important in the promoting growth and development. Since the majority of trade between the Asia 3 or ASEAN and other advanced economies in North America and the EU involve groups of tradable commodities of a hi-tech nature, it was claimed that this technology transfer is essential to growth and development in the Asia 3 or ASEAN.

The implications of this are threefold. First, while showing an interest in improving trade with Australia even though this trade impact may be negligible, the ASEAN+3 FTA members can still cultivate this regional trade and economic cooperation as useful for technology transfer from a developed country with a Western (NAFTA and EU) cultural background in the region. Second, a closer economic cooperation between ASEAN+3 and Australia may have an extra economic benefit in a global context when the major trading blocs such as NAFTA and the EU are seemingly heading more towards regional self-interest or even economic isolationism. Finally, a closer ASEAN+3-Australia relation or even similar bilateral agreements (discussed earlier) would put the country members in a closer framework to promote trade and growth and to avoid crises such as the economic and financial

turnout or terrorist attacks that, on recent experience, have wrought havoc on the "once miracle" economies in the region in the form of economic slowdown and deep recession, political and social unrest, welfare deterioration and regional instability.

## 11.8 SUMMARY AND CONCLUSIONS

In the preceding sections we have provided a brief description of the emergence of new Asian regionalism including a major FTA, namely the ASEAN+3, and the logical link between it and a novel modelling impact methodology, the extended gravity theory. The resulting trade-growth models for ASEAN-Australia, Asia 3-Australia and ASEAN+3-Australia and their empirical findings appear to support the premise that trade does cause growth in the trading partners, but the evidence is weak statistically and in magnitude. More important to growth, however, are the economic, financial and other external or domestic crises, and trade and economic relations policies that promote regional cooperation to avoid, or to manage better, future similar crises. However, trade and economic relations between the ASEAN+3 and Australia should be encouraged, because this policy is a useful and practical non-treaty arrangement or framework which will strengthen the bilateral cooperation to create mutual benefits for the partner countries.

## NOTE

- 1 For the foundation of this theory, see for example Linneman (1966), Harrison (1996), Frankel and Romer (1999).

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